CBT620
INSTRUCTORS OUTLINE
Worms, Germs, and Gloves
A Common-Sense Approach to Infectious Disease

Slide Text	Key Points/Notes
Part I: Biology of Infectious Disease Part II: Spotlight on Disease Part III: Practical Considerations	
Part I Biology of Infectious Disease	
Why should we care? • Helps us take better care of our patients • Helps us protect ourselves • Should be considered a requirement for living in today's world!	I think the last items is especially important for all of us (health care providers or not!). Mention disease in the news, from anthrax and smallpox to West Nile virus.
Course Overview • Part I: General information about "pathogens" (disease-causing agents) • Part II: Specific information about selected diseases (HIV, Hep B, and others) • Part III: Practical information on: – Assessing and treating patients with infectious diseases – Keeping yourself safe and healthy	
History • What caused disease? Early people didn't know... – Anger of the gods – An imbalance in body "humors" – Bad air • Horrific "cures" – Bloodletting – Opening the skull – Enemas, emetics	Picture shows an early (and common) cure: bloodletting Point of interest: leeches, which were used for bloodletting but then fell out of favor, are now being used for delicate operations, such as eye and facial surgery, to keep clots from forming. The enzyme in their saliva, hirudin, is being also investigated as a medical anticoagulant.
Pathogens • Disease-causing agents • Agent + host (person) + environment = disease • A quick review of these agents: – Bacteria – Viruses – Fungi – Parasites – Prions	
Bacteria • Primitive, one-celled organisms with genetic material floating loosely inside the cell (no nucleus) • Small (1 to 10 micrometers) • Most are harmless or even helpful	How does this size relate to something the students might know? Several thousand would sit on the eraser of a pencil

• Only a few cause disease	
Bacterial diseases • Tetanus • Plague • Botulism • Anthrax • Gas gangrene • Strep • Cholera • Staph • TB • Meningitis • Leprosy • Syphilis	
How do bacteria cause disease? • As part of their metabolism, some bacteria release enzymes or toxins which may harm our cells • When bacteria die, their disintegrating cell bodies cause harmful reactions inside our bodies • Bacteria reproduce by dividing in two — their numbers can increase exponentially	Picture that follows shows a mass of rapidly reproducing rod-shaped bacteria
How are bacterial diseases spread? • Feces (cholera) • Dirt (tetanus) • Droplets (tuberculosis, diphtheria) • Arthropods [fleas] (plague) • Sexual contact (syphilis) • Food (staph food poisoning, botulism)	Contaminated water is a major cause of morbidity and mortality in developing countries.
How do we fight bacterial disease? • Cells of the immune system patrol the body for bacteria and other foreign invaders	These immune cells are various types of white blood cells (leukocytes). The bodies of white blood cells that have died defending the body make up “pus.” The video shows how neutrophils (a type of white blood cell) stream to the site of an infection. Click to play, then click next to go on to the next slide. **** If you don’t have SOUND, you can read it. The voice on the video says: “The white cells of the immune system’s second and third lines of defense perform a coordinated, interactive defense effort bent on not only destroying an invading pathogen but also preparing for defense against any future exposures to that same pathogen.”
• If they encounter a foreign invader, they will engulf and destroy it.	Click to play the video. It shows an immune cell engulfing and destroying a small foreign particle.
How are bacterial diseases treated? • Antibiotics -- medicines prepared from fungi -- are toxic to bacteria	Ask students to name some antibiotics. Ask them to imagine a world without antibiotics, in which people died of relatively minor infections.
Do antibiotics always work? Antibiotic resistance • Due to widespread and often unnecessary use of antibiotics — Livestock industry — Pediatric infections (earaches), viral infections	Make sure students understand the concept of antibiotic resistance – it’s important. Why do doctors prescribe antibiotics for viral illnesses (when they won’t work)? Possibly because they are trying to prevent a subsequent bacterial infection. Also possibly because they think their patients WANT antibiotics even though it won’t help a viral disease.

– Public panic (anthrax) • Due to improper use of antibiotics – Not finishing course of antibiotics	
Virus • Small bit of genetic information (RNA or DNA) surrounded by a protein coat • Tiny: 20 nanometers • Cannot reproduce on their own but must take over a living cell	These are important points. Viruses aren't really alive in the true sense of the word. Bacteria clearly ARE alive. How small is 20 nanometers? Thousands to millions could fit on the dot made by a pencil.
Viral diseases • Chickenpox • Smallpox • AIDS • Hepatitis • Rabies • Ebola • Influenza (flu) • Common cold • Hanta disease • Rubella • Yellow fever • Herpes • Polio • West Nile disease	
How does a virus do its damage? • The virus enters the body and searches for particular markers on particular cells • The virus or viral genetic information enters the cell • This genetic information provides a template by which the cell constructs more viral particles • Viral particles overwhelm the cell, and it bursts, or viruses bud from its surface.	This series of images and video shows how a virus infects a cell. The dark spots inside the cell are viral particles. It's a key point that the students should understand: viruses do their damage from INSIDE living cells, and they do so by taking over the machinery of the cell, forcing it to make more viral particles. Ultimately the cell is destroyed and the virus escapes to infect more cells. Click on the movie to run it. MOVIE TEXT: "A virus is the smallest and simplest of microbes. Unlike a bacterium, it doesn't have the ability to reproduce on its own. It must enter a living cell. Once inside, the virus sheds its outer protein coat. It hijacks the host cell's machinery in order to reproduce. The long chains of viral genes are duplicated by viral proteins made in the host cell. Once all the parts for the new viruses are completed, they reassemble. Within hours, a single infected cell can give rise to a million new viruses. They destroy the host cell and go on to infect new cells."
How are viruses spread? • Blood (HIV, Hep B & C) • Droplets or direct contact (cold, flu) • Saliva (rabies) • Feces (Hep A) • Insects (West Nile virus)	
What happens when you get a viral disease? • Die (rabies, HIV, Ebola) • Carrier state (Herpes, sometimes Hepatitis) • Recover (flu, common cold, chicken pox)	This is an oversimplification, but it helps them to understand what happens in real life – after all, when you get a cold, you DON'T have it forever, and the reason you don't is that you have an amazing system called the immune system which keeps you healthy. As far as the carrier state, herpes simplex (the virus that causes cold sores) provides a great example. The body

	causes cold sores) provides a great example. The body says to the virus: "You can live in my house, but don't cause any trouble." And most of the time, the virus does just that: it hides inside the cells and is essentially dormant. So doing, it doesn't incite the wrath of the immune system. However, if the body gets stressed, from a cold, sunburn, or some other cause, the virus takes advantage of the fact that the immune system is preoccupied, and it begins to cause trouble. Then the person may get a cold sore (it is called a "cold sore" because it is often associated with a viral disease like a cold even though it is caused by a different virus). Interestingly, herpes is a very common virus, affecting from 50 to 90% of the population.
Recover — how? • Virus-infected cells send out chemical distress signals • Cells of the immune system recognize those signals, identify, and destroy infected cells	Take the example of recovering from a common cold. What happens? These pictures illustrate how what our body can do far better than any drug: recognize virus-infected cells and destroy them. Sickness: make the point that many signs and symptoms are not from the invading pathogen but from the immune system gearing up to fight off the invader.
How are viral diseases treated? • Not very well! • Mostly *symptomatic* treatment • Some anti-viral drugs interfere with a portion of viral reproduction • Wait for the disease to run its course. We rarely can treat viral diseases directly because we have little access to pathogens that go inside cells	
The story of natural immunity … (or, why you only get chickenpox once)	Go through the next few slides so you thoroughly understand them; it's an amazing story. Sometimes it helps to draw this on a whiteboard, but the illustrations are provided for your use. You should also be aware that this (and the next section on vaccination) is of necessity a significant oversimplification, but you can refer students to a good microbiology textbook or the internet if they want more detailed information.
Turning natural immunity to our favor … (or, how to make a vaccine)	If you understand natural immunity (above), this will be easy to explain – it is basically a variation of natural immunity, except that the virus in question (the vaccine) has been deactivated and cannot cause disease.
Summary of bacteria and viruses	Quickly review this table, which shows the major differences between the two most common pathogens, bacteria and viruses.
Fungus • Simple, primitive organisms • Most are harmless or even beneficial; very few cause disease • Examples of fungal diseases – Ringworm, athlete's foot – Thrush – Cryptococcal meningitis	I always take this opportunity to put in a good word for fungus, which are responsible for decay and without which our world would be inundated with dead material The pictures show athletes foot (those are toes), and thrush (that's a person's mouth). You can mention that thrush is common in people with HIV infection and other immunosuppressed states; people with healthy immune systems are much less susceptible to fungal infections.

Parasites • Animals which live inside the body of a human or other animal • Can be small (one cell) or large (50 ft in length!) • Complex lifecycles	Many college courses have been devoted solely to parasites; they are quite amazing in their adaptations. I didn't include the fish tapeworm slide because it is relevant to EMS, but simply to show students how incredibly complex these parasites are — look at all the many hosts and forms this parasite goes through!
How are parasites acquired? • Insects (malaria) • Meat or fish (tapeworms) • Feces-contaminated soil (tapeworms) • Feces-contaminated water (Giardia)	You can mention that giardia is the organism that backpackers and hikers need to be cautious about if they drink untreated/unfiltered water (though some believe that the danger of giardia in the Pacific Northwest is overblown).
Parasite burden • We are largely free of parasites • Most people in developing countries are host to a large number of parasites	Help students understand how fortunate we are to live in a part of the world where we have clean water, abundant food, and good health care. Most of the world does not live that way, and many are chronically infected with parasites ranging from tapeworms to malaria, which cause diarrhea, malnutrition, anemia, an ultimately a significantly shortened lifespan. A quote from the curriculum might be worth reading: A scientist, studying the parasites of people in a very poor area of Thailand, asked for stool samples. He describes the samples sloshing liquidly in the collection cups. He asks: "How long have you had diarrhea?" "Diarrhea?" the person would reply curiously. "I don't have diarrhea. My stools are always like this."
The story of the caduceus	Read the sideline in the curriculum … this is a fascinating story which students always seem to enjoy.
Prions • Small piece of deformed protein that accumulates in nervous system tissue • Deformed protein can cause deformity in other proteins • These deformed proteins accumulate and cause deterioration of nervous system tissue	I start this story in the setting of New Guinea in the 1950s, when the people of the Fore tribe practiced cannibalism and also were falling prey to an odd neurologic disease ("kuru") that was ultimately traced to their consumption of infected brains. It's a fascinating story. The brains were infected with prions — the unknown and invisible threat. Keep in mind that they aren't really alive so it isn't really possible to kill them in the conventional sense. They are far simpler and less alive than viruses. In addition to the information in the text, I'd highly recommend checking out some of the many "mad cow" sites on the Internet, or better yet, read the book listed in the bibliography, "Deadly Feasts." Students often have lots of questions about prions that you can answer if you do a little background reading.
Part II Spotlight on Disease	
Diseases of Interest • HIV/AIDS • Hep B • Hep C • TB • Smallpox • West Nile Virus	Why these diseases? Emphasize that they are either potentially transmitted through an occupational exposure (HIV, Hep B, etc.), or are of interest because they have been in the news lately. Students often want more information about one or another favorite disease but there simply isn't time to talk about all of them.

AIDS (Acquired Immunodeficiency Syndrome) • Caused by the Human Immunodeficiency Virus (HIV) • HIV attacks the cells of the immune system As the immune system fails, the person becomes susceptible to "opportunistic" diseases and infections	Remind students that, as a virus, HIV goes looking for particular receptors to attach to – and those receptors happen to be on the cells of the immune system. Like a good virus, HIV then goes INSIDE the cell. The person then becomes sick not because of the direct affect of the virus (although there is some of that), but because the immune system is being suppressed, leaving the person susceptible to many diseases and infections. This is an important point, and explains why HIV disease presents in so many different ways.
A sampling of opportunistic diseases and infections • Pneumocystis carinii (parasite) • Kaposi's sarcoma (cancer) • Cryptosporidia (parasite) • Candida (fungus) • Toxoplasmosis (parasite) • Cytomegalovirus (virus) • Histoplasmosis (fungus) • Tuberculosis (bacteria)	Parasite causing pneumonia Cancer of the mouth, throat, and GI tract Parasite causing profuse, watery diarrhea Fungal infection of the mouth and GI tract Parasitic infection of the nervous system Virus causing retinal or GI disease Fungus affecting the respiratory system Bacterial infection of the lungs
State of the Epidemic • Worldwide — 42 million are infected, and increasing — Parts of Africa, India, and SE Asia are hardest hit • 30% of all adults in parts of Africa are infected • In small pockets, 70% of adults may be infected • Rapid progression from HIV infection to AIDS • High mortality rate from diarrheal diseases associated with HIV infection	I always tell people that we don't have a problem with HIV/AIDS compared to the problem of the disease in many developing countries. People in these countries are often so debilitated and malnourished already that their progression from HIV infection to death is very rapid. The reason for the high incidence of death from diarrheal disease is that many people in developing countries already have a parasite burden and HIV infection means that they are unable to defend themselves from these parasites and pathogens.
Closer to home — US Statistics • Almost 1 million people are currently infected • 25% don't know it! • 360,000 people have AIDS • There are approx 40,000 new infections per year	Maps show the increase in HIV over the years, and also the prevalence of the infection in the urban areas.
HIV Infection vs. AIDS (as defined by the CDC) • HIV Infection — Infected but may be asymptomatic or have minor symptoms for up to 10 years • AIDS — CD4 count below 200 (normal is in the thousands) — Presence of one or more opportunistic diseases	I sometimes draw a pyramid of HIV disease: those at the bottom of the pyramid are people at risk but not infected. Moving up, we encounter the large number of people who are infected with HIV but don't know it (and may not know it for 10 years if they don't get tested! – but they are still infectious). Then we come to those who are infected with HIV but have not yet progressed to AIDS. And finally, the smallest number, at the top of the pyramid, are those who are diagnosed with AIDS — the only number we really have a good handle on, and yet just the tip of the iceberg in terms of people affected by HIV disease.
Transmission	Sometimes students have questions about the details of

• Blood and other bodily fluids – Sexual contact – Needlesharing – Needlesticks – Transfusions prior to testing – Mother to infant (in utero, during delivery, by breastfeeding)	HIV transmission. I usually refer them to the CDC's website (www.cdc.gov), which has a great deal of detailed information.
HIV is NOT transmitted by ... • Casual contact (hugging, kissing, etc.) • Insects or insect bites • Contact with saliva, tears, sweat, feces, urine, or vomit (unless they are visibly bloody) • Food, water, or air • Swimming pools or toilet seats	Please emphasize these. There is still some misunderstanding out there about how the disease can be transmitted.
Presentation • Depends on the opportunistic disease! • Remember: a person with HIV infection may get a variety of infections/diseases • Common presentations – Dehydration secondary to diarrhea – Dyspnea secondary to pneumonia – Seizures, altered mental status due to nervous system infection – Rash, nausea, vomiting, hypoglycemia due to medication reaction – End-of-life issues	Again, emphasize that unlike many diseases which attack a particular system (e.g. asthma, the respiratory system), HIV attacks the IMMUNE system, so we are seeing the result of a suppressed immune system being vulnerable to lots of <u>different</u> diseases and infections, which can attack any of the body systems. I often ask students about their experiences with HIV/AIDS patients. Sometimes we get into lengthy discussions. This would be a good time to remind students about the "compelling reasons" doctrine (for South King County; other areas on a case by case basis) in which resuscitation may be withheld for a terminally ill patient on patient or family request (see updated Patient Care Guidelines for details).
Treatment • Anti-retroviral agents (e.g. AZT) prevent virus from replicating (reproducing) • Protease inhibitors (e.g. Indinavir) prevent the virus from forming inside cells • Treatment and prevention of opportunistic diseases • Palliative and comfort care	
Prevention • Lifestyle – Practice safe sex – Don't use recreational IV drugs • Occupational – Protect yourself from exposure to blood/bodily fluids and ESPECIALLY needlesticks – There is NO vaccine to prevent HIV infection!	Remind them that we'll be talking more about exposures in a few minutes – how to minimize the risk and what to do if you get one.
Hepatitis B • Old name: "serum (blood) hepatitis" • Inflammatory liver disease caused by Hepatitis B	

virus • Transmitted by – Contact with blood or other bodily fluids – Sexual contact – Sharing needles or needlesticks – Mother to infant	
Types of Hepatitis B • Acute – About 1/3 are asymptomatic – About 1/3 have mild, flu-like symptoms – About 1/3 have jaundice, fatigue, nausea, fever • Chronic – Up to 10% of newly infected adults (above) become "carriers." – Half of these develop chronic cirrhosis or liver cancer jaundice	Pictures show a person with jaundice and cirrhosis (this accumulation of fluid secondary to cirrhosis is called "ascites" and is also a complication of congestive heart failure and various other fungal and parasitic diseases).
Treatment • No treatment for acute infection • Chronic hepatitis B may be treated with – Interferon – lamivudine • Other treatment is symptomatic	
Prevention • Lifestyle – Practice safe sex – Don't use recreational IV drugs • Occupational – Protect yourself from exposure to blood/bodily fluids and ESPECIALLY needlesticks – Get vaccinated!	Do you see a common theme? Live a healthy lifestyle and avoid needlesticks.
The Problem • <u>Prior to vaccination</u>, health care workers were 10 times more likely to have Hep B than the general population • <u>Prior to vaccination</u>, infection rate of HCWs: 15,000 to 20,000 per year • <u>Prior to vaccination</u>, 200 HCW per year died of complications of Hep B	I find it ironic – and often mention – that in the days before the Hep B vaccine, we knew that Hep B was transmitted by blood and we knew that it carried a significant morbidity and mortality for health care workers. YET, universal precautions as we know them today were not developed until the HIV epidemic – with all its stigmas – although that was a far lesser risk.
The Solution: Hep B Vaccine • Hep B vaccine (and universal precautions) have greatly reduced the incidence of Hep B among HCWs • Is highly successful in preventing vaccination • Has a low incidence of side effects • Have you been vaccinated?	Stress the importance of vaccination. You can also note that infants are now being vaccinated against this disease.
Hepatitis C • Old name: "Non-A, Non-B"	

• Transmission is primarily by blood • Most infections are due to — IV drug use — Contaminated blood from transfusion (prior to testing which began in 1992) • Rarely, can be transmitted sexually	
Hep C • 80% of those with Hep C are asymptomatic • However, up to 75% may develop long-term infection • 15% may develop cirrhosis over 20 to 30 years • Less than 3% die from complications of their disease (cirrhosis or liver cancer)	
Treatment • Interferon • Ribavirin • Symptomatic treatment	
Prevention • Lifestyle — Don't use recreational IV drugs — Practice safe sex • Occupational — Protect yourself from exposure to blood/bodily fluids and ESPECIALLY needlesticks (transmission is relatively low risk, however) • No vaccine for Hep C	
Tuberculosis • Bacterial infection of the lungs (and occasionally other parts of the body) • Less than 10% of those INFECTED with TB develop active (symptomatic) disease • INFECTION (not active disease) is determined by a positive PPD (skin test)	Be sure you understand the difference between TB INFECTION and ACTIVE DISEASE. Students are often confused about this, and I like to emphasize it. It will help them be less paranoid if a co-worker suddenly develops a positive PPD or if they see a patient who is taking (prophylactic) TB meds.
Tuberculosis • INFECTION only: no symptoms, positive PPD • ACTIVE DISEASE (10% of those infected): — Weight loss — Fatigue — Night sweats — Low-grade fever — Coughing up blood • Once <u>infected</u>, risk of developing <u>active disease</u> is greatest in first year or two of infection, when immunosuppressed, or in later years of life (>65).	As an aside, if it comes up, why is that a person with a latent TB infection may develop active disease years or even decades after the initial infection. Why is it not possible to eradicate the disease with antibiotics? The reason is that the bacteria that causes TB, unlike most bacteria, is an INTRACELLULAR parasite – it goes inside the cells (like a virus!), where it often remains dormant for long periods of time. As a result, it can effectively hide from the immune system and from complete eradication by medications. X ray shows a person with tuberculosis whose lung tissue has been damaged by the bacteria.
Transmission • Via small airborne particles expelled by cough, sneezing, or speaking	At highest risk are people living with someone with TB, but even then, under such close quarters, many people avoid infection. Even those who become infected rarely develop active disease. The immune system is a remarkable thing!

• Are inhaled into small airways • Prolonged exposure in confined space confers highest risk	active disease. The immune system is a remarkable thing!
Who gets TB? • People who are homeless or who have little access to health care • Immigrants from countries where TB is prevalent • Residents or employees of long-term institutional settings (e.g jails)	
Prevention • Maintain a high index of suspicion in patients who present — From a high risk population — With TB signs and symptoms • Put mask on patient (even an oxygen mask will limit expelling of particles) • Consider use of HEPA mask for yourself • Limit confined space exposure (open windows, doors)	
Prevention, continued • Remember! TB is a reportable condition. • Health department should notify all close contacts (for example, those that transported the patient). If in doubt, CALL! • If you have a significant exposure: — Get baseline TB test — Repeat test in approx 3 months to determine if infection has occurred — If positive, consider prophylaxis to prevent the development of active disease	
Treatment • Regimen of two or more medications including: — Isoniazid (INH) — Rifampin (RMP) — Streptomycin (SM) — Ethambutol (EMB) • After 2 to 3 weeks of treatment, most patients are no longer infectious, although they may need to be medicated for 6 months to one year • People with AIDS who are infected with TB are usually given lifelong TB prophylaxis.	What does this mean? Just because someone is on TB meds DOESN'T mean that they are necessarily INFECTIOUS. It is important to ask: a) when were they prescribed the drugs, and b) have they been taking them regularly? If they have been taking their meds for several weeks, they are not likely to be infectious.
Smallpox • Viral disease • Last naturally occurring case in the US was in 1949 • Last naturally occurring case in the world was in 1977 in Somalia.	Why the concern? Both the US and the former Soviet Union had stores of smallpox in a freezer just in case it was necessary to have access to the virus to study it. It is unknown whether, years ago, samples of the virus were perhaps distributed elsewhere to other countries. Smallpox is a scary disease. Historically, it has one of the most devastating diseases. Prior to the advent of

• Concern about smallpox as an agent of bioterror since possible stores of virus remain hidden	vaccination, there was an old saying: "Mothers only counted their children after they had had the smallpox."
Transmission • Direct face-to-face contact • Direct contact with infected bodily fluids • Direct contact with contaminated objects such as bedding or clothing	
Presentation • Fever, often 101 to 104 degrees F • Malaise • Headache, body aches • Nausea, vomiting • Rash starting on face, spreading to arms, legs, hands, feet	Historically, approximately 30% of people who acquired smallpox died from it. Cause of death was often a secondary bacterial infection.
Smallpox vs. Chickenpox • SMALLPOX • Deep lesions develop at the same pace, look identical • Lesions densest on extremities • Lesions found on palms and soles • CHICKENPOX • Superficial lesions develop in "crops" of different ages • Lesions densest on trunk • No lesions on palms or soles	
Smallpox vs. chickenpox lesions	Graphics demonstrating the difference between the two diseases. Since most physicians and other health care workers today have never seen a case of smallpox, they will need to study the pictures and be alert if an unusual rash comes in to the ER.
Prevention • Universal precautions • Wear gloves and mask • Don't re-use bedding or other contaminated items • Vaccination??	
Smallpox vaccination • Smallpox vaccination is a LIVE vaccine. • Smallpox vaccine is *Vaccinia*, a related disease which confers immunity to smallpox • Smallpox vaccine causes you to develop vaccinia • Smallpox vaccine is even effective if given 4 to 5 days <u>after</u> exposure	The history of smallpox vaccination is fascinating. Edward Jenner, in the late 1700s, noticed that milkmaids rarely got smallpox, however they came down with a related, but much milder disease, called cowpox. A person who had cowpox was immune from smallpox. (You can remind the students how getting a viral disease confers immunity to that disease in the future.) Based on this knowledge, Jenner developed a vaccination based on cowpox (in fact the word "vaccination" comes from the Latin, VACCA, which means cow).
Smallpox vaccine • Minor side effects – Most people experience sore arm, fever, body aches	One of the most important points about smallpox vaccine is that, unlike most vaccinations, which are made from a disabled form of the virus, smallpox vaccination is made from a LIVE (related) virus. When you get the vaccination, you develop the disease. While the disease is self-limiting

— 1 out of 3 people miss school or work due to symptoms • Serious side effects — Encephalitis, progressive vaccinia disease, etc. — 1 out of 100 to 1000 people • Death — 1 or 2 out of 1 million people • *Adverse reactions may be more common now due to increasing number of people who are immunosuppressed due to disease, medications.	in most people, a few have significant reactions, and if you vaccinate enough people, one or two will die from it.
Vaccination: • Consider: — Possible vs actual threat — Risks of vaccination — Reimbursement for time lost from work, possible significant side effects/illness • Ongoing evaluation • Educate yourself, make a personal decision	Whether a health care worker, in the absence of a current and credible threat (i.e., no documented case of smallpox in years) should receive the vaccination, is debatable. In the end, it comes down to a personal decision. This is a great topic of discussion. A bit of reading and research ahead of time will provide some good information to present to the class if they are interested. A great source is the CDC's website: www.cdc.gov
West Nile Virus • Virus endemic to Africa, Asia, and the Middle East • Discovered in US in 1999 • Birds (especially crows and related birds) are an animal reservoir • Transmitted by the bite of a mosquito • NOT transmitted through casual person-to-person contact	Remind students: you are not discussing WNV because it is a significant threat, but simply because it's been in the news. Although we can expect to see more cases as the disease moves west, the disease currently gets far more attention than it deserves considering the number of people it infects, sickens, and kills. The last point, that it is not spread by person to person contact, is important. I added "casual" because it's possible that the disease can be spread by a transfusion. However casual contact (in the context that they would be encountering an individual on an alarm) will not to our knowledge transmit the virus.
Presentation • Most have NO symptoms • Some have mild illness with fever, muscle aches, fatigue, headache, and joint pain • Small number develop meningitis or encephalitis — High fever — Stiff neck — Confusion, coma — Seizures	
Prevention • VERY LOW risk — — Approximately 100 people died of WNV last year; most were older and with significant health problems — By contrast, 20,000 died from complications of the flu! • Vaccine currently being developed • Reduce your risks of being bitten by a mosquito	Make sure the students understand and can assess risk – i.e., WNV vs. the flu, blood on intact skin vs. a needlestick.

(wear long sleeves, repellent)	
Meningitis • General term means “inflammation of meninges” • Can be caused by a bacteria, virus, or fungus • Presentation — Fever, headache, stiff neck — Decreased LOC, seizures — Nausea, vomiting — Hypotension (late sign) — Splotchy rash, mottled extremities (late sign, especially in bacterial meningitis) • *IMPORTANT: Not all signs are present in all patients!	The last point IS important, because sometimes EMTs will check for a stiff neck, and not finding it, assume that the patient doesn’t have meningitis. Interestingly, some stats suggest that less than half of patients with meningitis have a stiff neck (although if they DO have a stiff neck, their likelihood of having meningitis goes way up).
Bacterial meningitis • Most easily spread from person to person (viral and fungal are far less transmissible) • Bacteria are expelled in a cough or sneeze, or through direct contact • Sudden onset of symptoms, including rash • Rapid progression — if untreated, death may occur in a day or less	RAPID is important … most EMTs can cite stories of a patient they saw with bacterial meningitis who was dead a few hours or a day later.
Bacterial meningitis • Treatment — Antibiotics — Supportive care • Prevention — When possible, place mask on yourself and patient — Possible prophylaxis (Cipro) if significant exposure	It’s important to note that other forms of meningitis (viral, fungal) are far LESS transmissible and are usually not a concern for prehospital care providers seeing the patient. That’s why if you bring in a patient with meningitis and they find that it’s viral, you won’t usually have to take any special precautions or medications.
Part III Practical Considerations	
Presentation of infectious disease • Depends entirely on the pathogen • Ranges from chronic (Hep C) to immediately life-threatening (meninogoccal meningitis) • Diagnosis is sometimes difficult even in a hospital setting • Treatment varies depending on the pathogen Warning signs • Rapid development of signs and symptoms • Unstable vital signs • Decreased LOC or rapid changes in LOC • Unusual rash	It is SO hard to come up with info on presentation of infectious disease because it depends on the type of pathogen and what body system the pathogen infects (viral vs. bacterial, respiratory system vs. GI system). The warning signs listed below are worth noting.
Treatment • Airway management/oxygen as necessary • Monitor vitals	

• Medics? – Altered LOC – Unstable vitals – Rapidly progressing course of illness (rash, etc.) • Mode of transport – POV, aid car, medic unit • Destination – Leave at home, clinic, ER • Call ahead?	
Other treatment considerations • People with chronic infectious diseases (e.g. Hep C, HIV) can also suffer from asthma, heart disease, etc. unrelated to their underlying disease • Documentation: it is acceptable to document infectious disease status (e.g. HIV infection) on the run report IF it is relevant to patient care • Maintain patient confidentiality with regards to disease status except for those with a "need to know." • Remember to use compassion and understanding in dealing with people with HIV and other infectious diseases	Picture shows the Names quilt that memorializes people who have died of AIDS.
Keeping yourself safe • Bloodborne diseases – HIV – Hep B and C • Airborne diseases – TB – Meningitis	
Prevention: bloodborne diseases • Needlesticks: statistically, this represents the greatest risk of acquiring a bloodborne disease • Be WATCHFUL, CAUTIOUS, and DELIBERATE when there are needles around! • Dispose of all needles carefully (such as epi-pens)	If the students learn nothing else from this class, I want them to appreciate that the greatest risk of acquiring a bloodborne disease is from a needlestick, NOT from getting blood on their hands. Current guidelines and SOPs emphasize the use of gloves. While not wishing to detract from these guidelines, I hope instructors will convey an understanding of the risk from different types of exposure (see following slides). EMTs may wonder how they would get a needlestick. Unfortunately it happens not infrequently, because they are working at scenes where paramedics and needles are present (not to mention their own needles such as epi-pens, which are VERY long and not self-sheathing). Every EMT at a scene needs to take responsibility for him/herself in studiously avoiding exposure to blood, and ESPECIALLY needlesticks.
Prevention: bloodborne diseases • Wear gloves if you anticipate exposure to blood/bodily fluids (or follow your department guidelines) • Wash hands after every patient (gloves actually INCREASE the number of bacteria on the hands of	

health care workers!) • Wear goggles/mask if there is a splash potential • Gowns may be worn for massive blood exposure (e.g. childbirth)	
Remember! • TRUE risk of bloodborne disease is NEEDLESTICKS • Gloves do not protect against needlesticks • Remove gloves before driving, talking on the radio, etc • Extensive latex glove use may lead to latex allergies (nitrile gloves minimize this possibility)	
Bloodborne Diseases • Where is the risk? — HIV? — Hep B? — Hep C?	
Occupational risk of HIV infection • VERY LOW! • Highest risk is needlestick with hollow-bore needle with infected blood (.3% or 1 in 300) • Next is blood on mucous membranes (.09% or 1 in 1000) • Blood on intact skin, or exposure to non-bloody bodily fluids such as feces, urine, vomit, or saliva is NOT a significant risk!	
CDC Data on Occupational Exposures • In 25 years, 52 total occupationally acquired HIV/AIDS infections • Of these, 23 were nurses, 16 were lab technicians • There were NO EMTs, paramedics or FFs with documented occupationally acquired infections	The difference between documented and possible occupationally acquired infection: A documented infection is one in which the infection resulted from a specific exposure in which the source patient is known to be infected. A possible occupational infection is one in which no specific exposure is known or documented, yet the person becomes infected (and denies other risk factors).
Putting risk in perspective • No paramedics, EMTs or FFs with documented occupationally acquired HIV infection in 25 years of the epidemic • IAFF data on motor vehicle accidents for career (union) firefighters ONLY: — 42 motor vehicle deaths in 2000 (a significant proportion of which could have been prevented with the use of seatbelts)	In other words, driving to the call is probably a greater risk to us than anything that happens on the call itself.
Other bloodborne diseases • Hep B — Prior to universal precautions and vaccination, health care workers had a very high incidence of Hep B — Use standard bloodborne pathogen precautions — Get vaccinated! • Hep C	

— Relatively low risk to HCWs — Risk is similar to HIV — Use standard bloodborne pathogen precautions — No vaccine	
Prevention: airborne diseases • Tuberculosis, meningitis • Wear a mask • Put a mask on the patient (when possible) • Followup!	
Bloodborne pathogen exposure • Wash area with soap and water if possible (bleach or other harsh chemicals are not indicated because they can damage tissue and increase its susceptibility to viral invasion) • Flush mucous membranes with water • Report incident <u>immediately</u> according to your supervisor • Follow your department's SOPs concerning reporting, baseline testing, post-exposure prophylaxis, etc.	Make sure you know your department's SOPs for responding to these types of exposures.
Post-exposure Prophylaxis (PEP) for HIV • HIV PEP (medication) reduces risk of infection by about 80% • Consider PEP for a significant exposure • What constitutes such an exposure? — High risk source patient or patient known to be HIV+ — Significant type of exposure (e.g. needlestick) • HIV/AIDS contact at Public Health can help with advice (see department SOPs) • YOUR decision whether or not to take PEP	Again, have your department's SOPs handy.
If you take PEP ... • Time is of the essence! — Ideally, PEP should be taken as soon as possible after exposure • PEP consists of medications with significant side effects and toxicity — Weakness, nausea, and vomiting are common — Potential liver toxicity and other problems — followup with physician — 33% of exposed health care workers stopped taking PEP due to adverse symptoms	
Other PEP • Hepatitis B — Hepatitis B immune globulin — Hepatitis B vaccine • Hepatitis C	

– No PEP recommended	
Airborne pathogen exposure • Followup with hospital if airborne exposure is suspected (according to your department's SOPs) • Meningitis – Post-exposure prophylaxis with antibiotic (usually Cipro) • Tuberculosis – Baseline testing with possible medications if followup testing is positive	
Scenario 1	Meningitis, although more common in children, can occur in adults. A stiff neck does not always occur. The unusual rash should be a warning. Treatment should be to support the ABCs, request medics depending on LOCs and vitals, and notify the hospital ahead of time so that antibiotics can be readied. Precautions should include standard precautions as well as airborne precautions (mask on patient, mask on EMT). If bacterial meningitis is diagnosed, prophylaxis may be recommended.
Scenario 2	People who are homeless and who have limited access to health care are at risk for tuberculosis, and the signs and symptoms presented here are consistent with that disease. Support ABCs and take airborne pathogen precautions. TB prophylaxis is only done in the event a TB-negative person becomes newly positive.
	I would encourage you to develop your own scenarios based on calls that you and your department have encountered. Use your department's SOPs to illustrate how the EMTs should handle these situations.